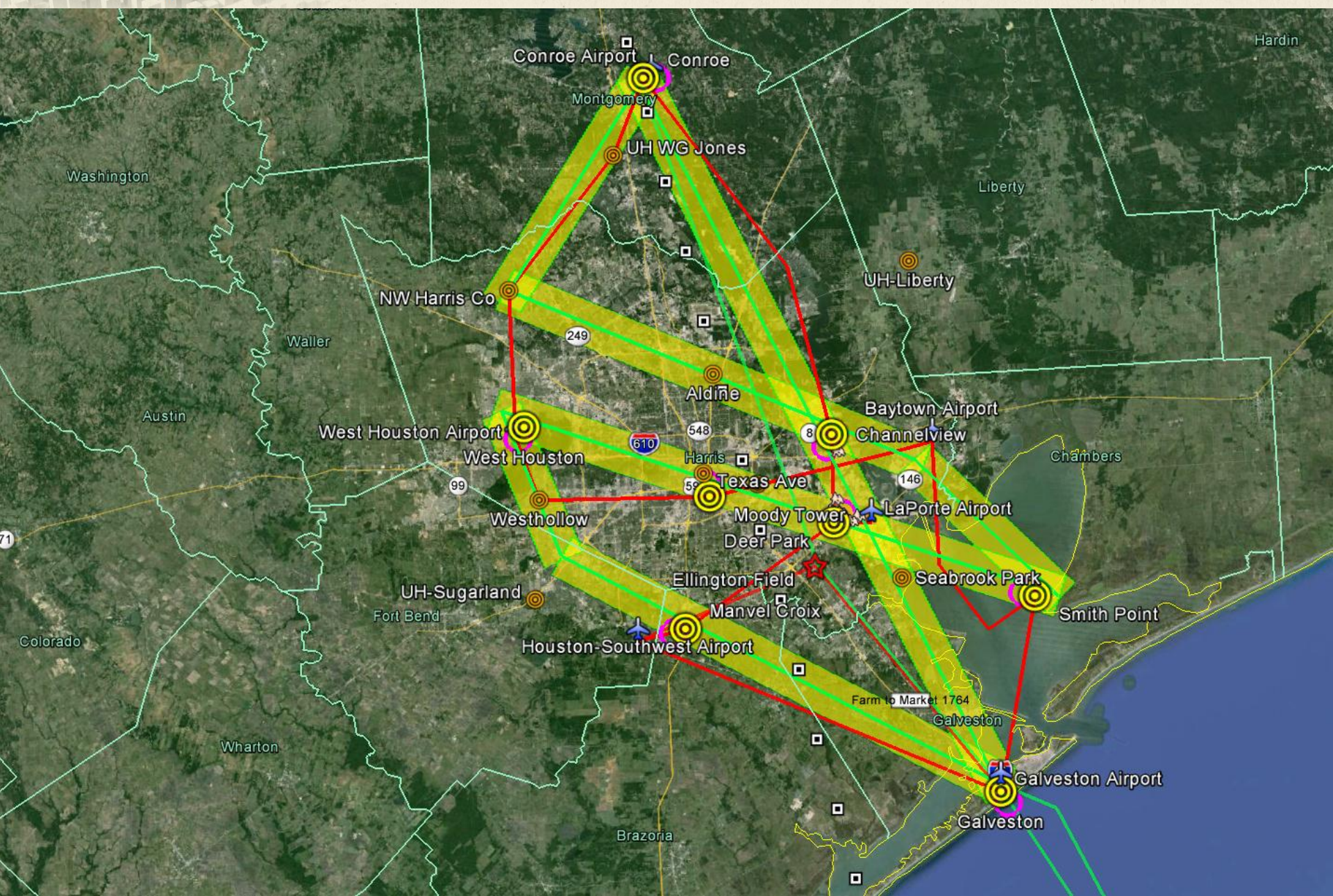




1. Houston Deployment Plans and Update
2. California data
3. Science Talk







*Changes since last telecon are shown in red*

Site Name	Spiral Y/N	Pandora Y/N	Aeronet Y/N	Missed Approach	Mobile Hook-up	other DISCOVER-AQ Augmentation
Aldine			Y			
Channelview	Y	Y	Y	N	Y	
Clinton	N	Y	Y	N	N	
Conroe (Airport)	Y	Y	Y	Y	Y	U. Texas – aerosols and NO <sub>2</sub>
Deer Park	Y	Y	Y	N	N	
Galveston	Y	Y	Y	Y	Y	NOAA Trace gases
LaPorte Airport	N	N	N	Y	Y	EPA Trailer, NOAA Ozone Lidar
Texas Avenue	N	Y	Y	N	N	EPA NO <sub>2</sub>
Manvel Croix	Y	Y	Y	N	Y	NOAA NO <sub>2</sub> , Baylor/Rice –neph and hi-vol samplers, NASA Ozone Lidar
Moody Tower	Y	Y(2)	Y	N	N	UMBC Leosphere, Appalachian State (CH <sub>2</sub> O, VOCs)
NW Harris Co	N	Y	Y	N	N	
Seabrook Park	N	Y	Y	N	N	EPA NO <sub>2</sub>
Smith Point	Y	Y(2)	Y	N	Y	NATIVE, Millersville, UMBC MPL, EPA-NO <sub>2</sub> , TCEQ Profiler, NOAA radiation
UH Coastal Center	N	N	Y	N	N	Pre-existing Aeronet, room for other instruments
UH Liberty	N	N	Y	N	N	
UH Sugarland	N	N	Y	N	N	
West Houston	Y	Y	Y	N	N	
Baytown Airport	N	N	N	TBD	N	Possible missed approach enroute from Smith Point to Moody Tower
Houston SW Airport	N	N	N	TBD	N	Possible missed approach (8 km west of Manvel Croix)
West Houston Airport	N	N	N	TBD	N	Possible missed approach enroute from Westhollow to NW Harris Co

Site Name	Pandora Y/N	Aeronet Y/N	Mobile Hook-up	Access Granted?	Comments
Aldine	N	Y	N		Aeronet negotiating directly with school for rooftop emplacement
Channelview	Y	Y	Y		Scaffolds and other work still pending
Clinton	Y	Y	N		
Conroe (Airport)	Y	Y	Y		Scaffolding in place, other work still pending
Deer Park	Y	Y	N		Scaffolding in place, complete
Galveston	Y	Y	Y		Scaffolding in place, complete
LaPorte Airport	N	N	Y		Scaffolding in place, other work still pending
Texas Avenue	Y	Y	N		Still negotiating details with Condo owners; EPA in contact with City of Houston
Manvel Croix	Y	Y	Y		Scaffolding in place, other work still pending
Moody Tower	Y(2)	Y	N		
NW Harris Co	Y	Y	N		Scaffolding in place, complete
Seabrook Park	Y	Y	N		Scaffolding in place, complete
Smith Point	Y(2)	Y	N		All details and arrangements should be coordinated through Rich Clark (Millersville University)
UH Coastal Center	N	Y	N		This site complete
UH Liberty	N	Y	N		This site complete
UH Sugarland	N	Y	N		This site complete
West Houston	Y	Y	N		Access is for rooftop instruments, still need to discuss possible NO2 measurement from TCEQ at this site

Yellow indicates that intended activities are still on track

Green indicates completion of intended activity or permission

15 July – Sites open for Pandora and Aeronet installations

12 August – Sites open for Trailers and Mobile units

15 August – Met Profiler set up completed

Initial site visits need to be coordinated with Jim Thomas ([jwinthomas@embarqmail.com](mailto:jwinthomas@embarqmail.com)) and Raj Nadkarni ([Raj.Nadkarni@tceq.texas.gov](mailto:Raj.Nadkarni@tceq.texas.gov)). The project will provide lock access codes for subsequent visits.



## Smith Point Status



POC for all questions and requirements: Rich Clark (Richard.Clark@millersville.edu)

Balloon operations will be allowed to 1570 feet (478 meters). Two balloons will be operated (one solely for the transponder). Also authorized for 2-3 nighttime ops.

Power upgrade at Spoonbill RV Park has been invoiced to SSAI and is progressing.

Communications are still be figured out (possibly satcom, but stay tuned)

Rich Clark and Tracy Woody (Spoonbill RV park) have settled on acceptable language for the legal agreements to operate at Smith Point. Each group will need to have a document signed with similar language:

"Neither of the parties shall assume any liabilities to each other. As to liability to each other or death to persons, or damages to property, the parties do not waive any defense as a result of entering into this contract. This provision shall not be construed to limit the Commonwealth's rights, claims or defenses that arise as a matter of law or pursuant to any provisions of this contract. This provision shall not be construed to limit the sovereign immunity of the Commonwealth or of the State System of Higher Education or the University."



## *Mobile Lab Operations*



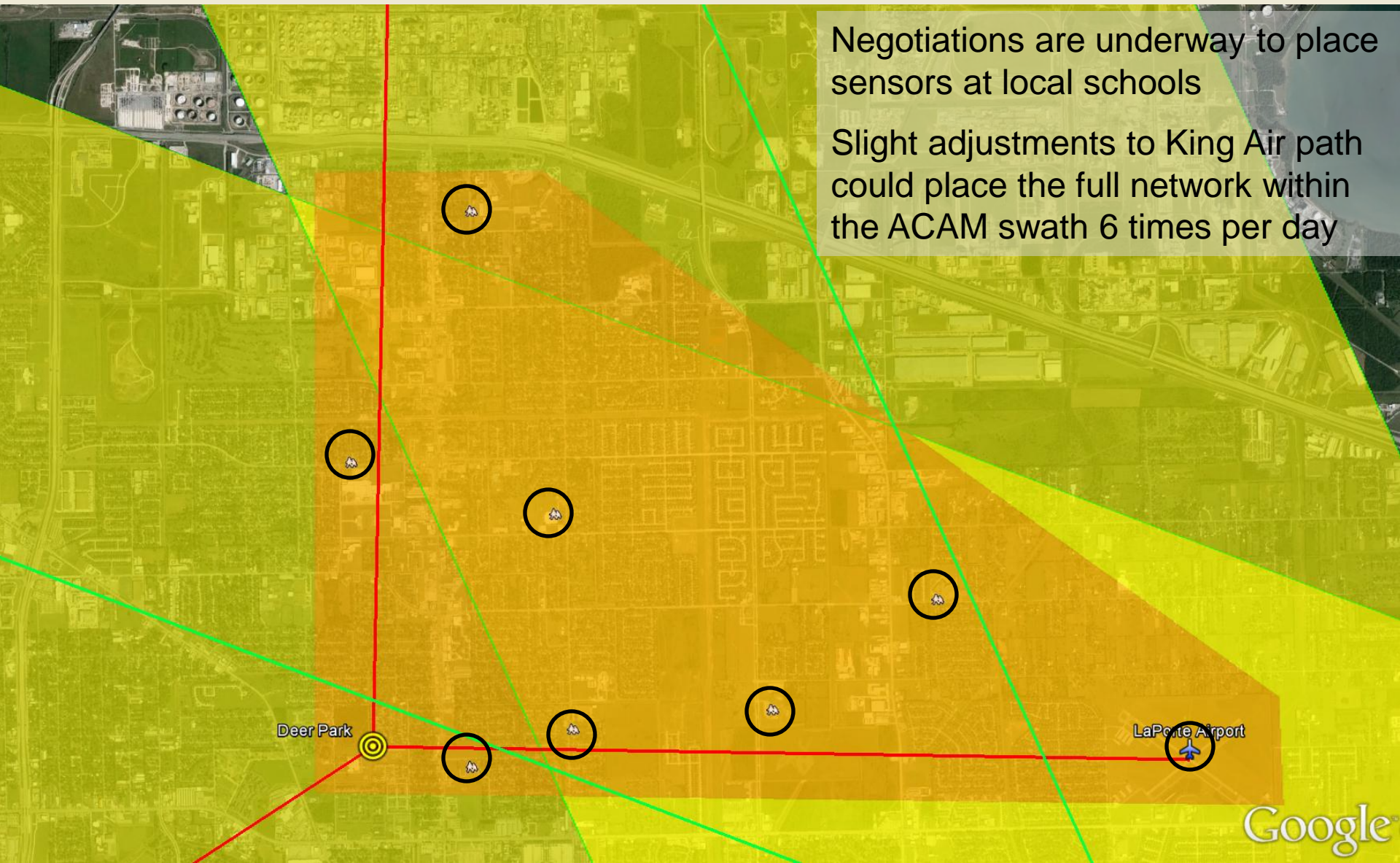
Due to the attention-grabbing nature of the mobile labs (and P-3B) operating in close proximity to petrochemical and other facilities, a letter is being drafted for Homeland Security. A copy of this letter will be provided to show to any authorities in case you are stopped and questioned.

We need to establish a point of contact for coordinating the use of the mobile hook-ups across the study area for stationary sampling and overnight periods.

While mobile operations are flexible in nature, it would be good to have a strawman plan for each vehicle in terms of where and how they anticipate sampling. That will help get them into the collective mindset of the team in terms of the integrated observing strategy.



*Iq Mead and Rod Jones (University of Cambridge) and LandTec, Inc.*



**The sensor is the Geotech AQMesh-5**

**The unit requires no power and operates unattended.**

**Subsequent to installation, visits would be only on an as needed basis and in many cases may not be necessary at all.**

**Sensors can be mounted on any pole (sign, flag, fence, etc.)**

**A visiting teacher suggested early emplacement during the week of 19 August before school starts on 26 August (need to check feasibility with Iq, Gregor, and Bobby).**



**Units will continuously monitor key pollutants: ozone ( $O_3$ ), nitrogen oxides (NO and  $NO_2$ ), carbon monoxide (CO), and sulfur dioxide ( $SO_2$ ) to extend coverage from the Deer Park site where air quality is monitored by the Texas Commission for Environmental Quality (TCEQ)**





## Logistical Issues and Possible Efficiencies:

Travel – There will be two WBS accounts for civil servants and two tasks for contractors/grantees. You will need to be specific with Diane Zeimet regarding which project you are travelling under. Sometimes it may get a little messy, but teams should consider splitting their travel by personnel even if there is some overlap in duties.

The 30-day rule will need to be considered by those working both projects.

Badging – All badging requests for personnel in groups associated with both SEAC<sup>4</sup>RS and DISCOVER-AQ will be handled by ESPO. We will handle all requests for groups specific to DISCOVER-AQ only. Once we have all of your information compiled, we will remind you of who you need to coordinate with for badging needs.

DISCOVER-AQ	STATUS	SEAC <sup>4</sup> RS (handled by ESPO)
Iq Mead (UK)	awaiting more data	Armin Wisthaler (Italy)
Gregor Stewart (UK)	submitted	Tomas Mikoviny (Slovakia)
Detlef Mueller (Germany)	submitted	Markus Müller (Austria)
Eduard Chemyakin (Russia)	submitted-need new visa	Phillipp Eichler (Germany)
Basak Karakut Cevik (Turkey)	awaiting more data	Petter Weibring (Sweden)
Yu Jun Leong (Malaysia)	all data received	Suzanne Crumeyrolle (France)
Tara Yacovitch (Canada)	no data received	Nikolai Balashov (Russia)
Christoph Senff (Germany)	need passport scan	Ewan Crosbie (UK)
Yunsoo Choi (S. Korea)	submitted (green card)	
Paola Massoli (Italy)	awaiting more data	

Luci will only be assisting with badges for the names listed under DISCOVER-AQ.

**All information is needed by 5 July**

For those listed under SEAC<sup>4</sup>RS, please ensure that you have indicated ALL access requirements for both projects (e.g., Wallops)

DISCOVER-AQ	
Cody Floerchinger (Aerodyne)	Barry Lefer (UH)
Edward Fortner (Aerodyne)	James Flynn (UH)
Scott Herndon (Aerodyne)	David Knapp (UCAR)
Edward Niple (Aerodyne)	Denise Montzka (UCAR)
Rob Roscioli (Aerodyne)	Andy Weinheimer (UCAR)
John Holloway (NOAA)	
Clare Flynn ( UMd)	

This list is for people needing routine access to Ellington Field during the deployment. A separate list on the next page addresses visitors only expecting to make a visit or two and will not need more than a day badge.

Please submit additional names to Luci Crittenden ([Lucille.H.Crittenden@nasa.gov](mailto:Lucille.H.Crittenden@nasa.gov))

IdMAX instructions for those who already possess a NASA badge will be forthcoming.



DISCOVER-AQ	
Lea Ruiz (UT)	Raul Alvarez (NOAA)
Jeffrey Bean (UT)	Xinrong Ren (NOAA)
Cameron Faxon (UT)	Winston Luke (NOAA)
Rob Griffin (Rice)	Paul Kelley (NOAA)
Carlos Hernandez (Rice)	Andrew Langford (NOAA)
Bianca Baier (Penn State)	Mike Hardesty (NOAA)

This list is for people making single visits or periodic stops at Ellington that are not frequent. If you need more frequent access, please let us know. Otherwise, you will receive a day badge, and we will need to meet you when you arrive.

Please submit additional names to Luci Crittenden ([Lucille.H.Crittenden@nasa.gov](mailto:Lucille.H.Crittenden@nasa.gov))

ALL NASA-sponsored travel is under increased scrutiny and requires your name to be approved for travel through NASA, SSAI, or NIA. If your name is not on this list, then we need to hear from you regarding your team members and travel dates.

NOTE: Names highlighted in yellow are associated with research groups overlapping with SEAC<sup>4</sup>RS. Civil servants need to take care to charge the appropriate WBS and SSAI travelers need to stipulate with Diane Zeimet which project to assign your travel expenses.

## NASA CS

Anderson	Bruce
Beyersdorf	Andreas
Burton	Sharon
Chen	Gao
Cook	Anthony
Crawford	James
Diskin	Glenn
Duncan	Bryan
Ferrare	Richard
Geiger	Jimmy
Harper	David
Hostetler	Chris
Janz	Scott
Kleb	Mary
Martin	Robert
Pickering	Kenneth
Rogers	Raymond
Thompson	Anne
Yang	Melissa
Ziemba	Luke

## NIA - sponsored

Mead	Iq
Mikoviny	Tomas
Sachse	Glenn
Wisthaler	Armin

## SSAI - sponsored

Abuhassan	Nader	Holloway	John	Roscioli	Rob
Aknan	Ali	Hudgins	Charles	Slate	Thomas
Baier	Bianca	Knapp	David	Stauffer	Ryan
Balashov	Nikolai	Kowalewski	Matthew	Stewart	Gregor
Barrick	John	Labow	Gordon	Thornhill	Kenneth
Chemyakin	Eduard	Lin	Jack	Walega	James
Choi	Yong Hoon	Loughner	Christopher	Weibring	Petter
Cohen	Ronald	Martins	Doug	Weinheimer	Andrew
Crumeyrolle	Suzanne	Massoli	Paola	Winstead	Edward
Duffey	Kaitlin	McCullough	Kent	Wooldridge	Paul
Eichler	Philipp	Montzka	Denise	Xiong	Sam
Floerchinger	Cody	Moore	Richard	Yacovitch	Tara
Flynn	Clare	Mueller	Detlef	Zweers	Deb
Fortner	Edward	Müller	Markus		
Fried	Alan	Nault	Benjamin		
Halliday	Hannah	Niple	Edward		
Harward	Charles	Pusede	Sally		
Herman	Jay	Rana	Mario		
Herndon	Scott	Richter	Dirk		
Hoff	Raymond	Romer	Paul		

Home	Science	Instruments	Participants	Planning	Data	Events	Education	Multimedia
PLANNING >> <a href="#">Baltimore-Washington, D.C. 2011</a>   <a href="#">California 2013</a>   <a href="#">Texas 2013</a>   <a href="#">TBA 2014</a>								

Reports
Forecasting
Calendar
Hotel
Logistics

DISCOVER-AQ							
Today		August 2013		<a href="#">Print</a> <a href="#">Week</a> <a href="#">Month</a> <a href="#">Agenda</a>			
Sun	Mon	Tue	Wed	Thu	Fri	Sat	
28	29	30	31	Aug 1	2	3	
			CAR Instrument Install				
4	5	6	7	8	9	10	
	Anderson (CAPS and LARGE), Cohen, Holloway, NSERC Upload				Yang Upload		
					Fried, Wisthaler Upload		
11	12	13	14	15	16	17	
Yang Upload							
Fried, Wisthaler Upload			Diskin, Weinheimer, Barrick Upload				
	CAR Rack Upload						
18	19	20	21	22	23	24	
Diskin, Weinheimer, Barrick Upload				P3B FIIR	P3B FRR		
25	26	27	28	29	30	31	
	P3B ATP & ECF		P3B PCF	P3B MRR	P3B pack		
			Nominal King Air p	Nominal King Air s			





## *Accommodations during P-3B Integration and Download*



Tourist season will still be in effect during P-3B integration making it difficult to obtain accommodations within the allowance.

The Wallops Lodging Facility has 9 rooms available throughout the integration and download periods for less than half the cost of a room in Chincoteague. These rooms are available to everyone except foreign nationals, who are required to live off base. **(Rooms are still available.)**

Reservations need to be made quickly to reserve these rooms. Please contact Debbie Toth at 757-824-1697 to make you reservation and identify yourself with the DISCOVER-AQ project.

**(We will no longer be monitoring the situation in the dorms. If you are unable to get a dorm room and cannot find accommodation in Chincoteague at per diem, then you will need to stay in Pocomoke City, MD. It is much cheaper and only 20 minutes away versus 15 minutes for Chincoteague.)**



## *Accommodations in Houston*



We have secured a room block at the Homewood Suites at well below the per diem rate (\$99 per night versus \$109 per diem).

You should begin making your reservations now and identify yourself with the NASA DISCOVER-AQ project.

For those of you participating in both SEAC<sup>4</sup>RS and DISCOVER-AQ you may succeed in getting the lower rate for your entire stay, but it is not guaranteed.

If you are working on SEAC<sup>4</sup>RS only, we prefer that you not request to be part of the room block or seek accommodation elsewhere since we would like to preserve this preferred rate for DISCOVER-AQ.

SEAC<sup>4</sup>RS has a room block at this hotel for August only. If you overlap both experiments, you may need to identify BOTH room blocks to the hotel staff

To help, Homewood suites has requested that you make reservations through management (see next slide rather than front desk).



## *Accommodations in Houston*



**Homewood Suites by Hilton-Houston Clear Lake**

**Phone: 281-486-7677**

**Ask for Teresa Simplot or Jason Lincoln and identify yourself with the DISCOVER-AQ room block for any further reservations!**

**401 Bay Area Blvd., Houston, Texas 77058**

**Arrival Date: September 2, 2013 / Departure Date: October 1, 2013**

**Number of Rooms: 40**

**Room Type and Rate: One Bedroom Suite with a king bed @ \$99.00 per night plus tax (Note: All suites include a sofa sleeper in the living area.)** Room rates are quoted exclusive of local taxes and fees, currently 17%. If you are tax exempt, then each guest will be asked to sign federal tax exemption form at check in. **(Federal employees, please do this!!!!)**

### **Reservations/Payment:**

To make a reservation, please call the hotel directly and ask for the NASA Discover-AQ room block. All reservations are required to be guaranteed with a credit card.

### **Cancellation Policy:**

The room block will be released on August 18, 2013 and rooms at the above rate will be available on a rate and space basis. If it becomes necessary to cancel an individual reservation, to avoid a one night's charge of room and tax the reservation must be cancelled 6 pm 24 hours prior to the arrival date.

### **CHECK-IN/CHECK-OUT:**

Check in time is 3:00pm and check out time is 12:00 noon.





# Houston Deployment Schedule



NATIONAL AERONAUTICS  
AND SPACE ADMINISTRATION

SEARCH NASA



Home Science Instruments Participants **Planning** Data Events Education Multimedia

PLANNING >> Baltimore-Washington, D.C. 2011 | **California 2013** | Texas 2013 | TBA 2014

Reports

Forecasting

**Calendar**

Hotel

Logistics

## DISCOVER-AQ

Today September 2013

Print Week Month Agenda

Sun	Mon	Tue	Wed	Thu	Fri	Sat
Sep 1	2	3	4	5	6	7
	Transit to Houston	Media Day	Nominal 1st science			
8	9	10	11	12	13	14
	Nominal ship cruise					
15	16	17	18	19	20	21
	Nominal ship cruise					
22	23	24	25	26	27	28
	Nominal ship cruise					
29	30	Oct 1	2	3	4	5
		Return to WFF&Lal				

Events shown in time zone: Eastern Time



- 2 Sep - Transit to Houston
- **3 Sep - Media Day**
- 4 Sep - First possible science flight
- 1 Oct - Return to WFF
- Other dates of potential interest from TCEQ:

late Aug – AQRP request for proposals

late Oct – proposals due

Week of 11 Nov – ITAC meeting, chance to share preliminary results of campaign

## DISCOVER-AQ NASA P-3B (N426NA) FLIGHT ITINERARY AND PASSENGER MANIFEST

Houston - Sept. 2013

### TRANSIT FLIGHT

Pilot: Mike Singer  
Co-Pilot: Jeff Chandler  
3rd Pilot: Alan Baringer  
FE: Brian Yates

Flight #: DAQ-1 TRANSIT  
Date: 02/09/2013-Mon  
From: KWAL  
To: KEFD  
Time Out: \_\_\_\_\_  
Time Off: \_\_\_\_\_  
Time Down: \_\_\_\_\_  
Time In: \_\_\_\_\_

Total Hrs: \_\_\_\_\_

	Name	Organization/Instrument
1	John Barrick	PDS/NO2
2	Eric Buzay	REVEAL
3	empty seat	REVEAL
4	Tom Slate	DLH/DACOM
5	Charles Harward	DLH/DACOM
6	empty seat	DFGAS
7	empty seat	DFGAS
8	empty seat	NH3
9	empty seat	NOxy
10	David Knapp	NOxy
11	Markus Mueller	PTR-MS
12	James Geiger	AVOCET
13	Melissa Yang	AVOCET
14	Kaitlin Duffey	TD-LIF
15	Paul Wooldridge	TD-LIF
16	Andreas Beyersdorf	LARGE
17	Rich Moore	LARGE
18	Eddie Winstead	LARGE
19	Brian Norman??	ACM - crew
20	Jim Schultz??	ACM - crew

Flight Crew Total: 6  
Science Crew Total: 13  
Grand Total: 19

Changes or additions should be sent to Luci Crittenden

Transit may need to have fewer passengers due to extra weight of flyaway kit. Waiting for WFF to define max number of passengers.

***Space will be at a premium at Ellington Field. Any changes to these requirements can be sent to Luci Crittenden ([Lucille.H.Crittenden@nasa.gov](mailto:Lucille.H.Crittenden@nasa.gov))***

Requester	Tables	Chairs	Comment
Barrick	1	2	Looks OK
Beyersdorf	4	6	Satisfies requirements for both DISCOVER-AQ and SEAC4RS
Cohen	2	4	Satisfies requirements for both DISCOVER-AQ and SEAC4RS
Crawford	2	4	May get away with 1 table, but do need at least 4 chairs
Diskin	3	6	Satisfies requirements for both DISCOVER-AQ and SEAC4RS
Fried	2	4	Satisfies requirements for both DISCOVER-AQ and SEAC4RS
Hoff/Visitors	1	4	
Hostetler	4	7	Need one of these tables to be by the aircraft
Janz	3	3	Need one of these table to be by the aircraft
Pickering	1	3	Looks OK
Weinheimer	2	4	Includes space for Deb Zweers
Wisthaler	2	4	Satisfies requirements for both DISCOVER-AQ and SEAC4RS
Yang	1	2	Looks OK





## *Ellington Field Shipping POC*



*Anyone who plans to ship items to Ellington Field in advance of the truck shipment should use the following shipping address:*

***Wanda Frederick  
Attn: DISCOVER-AQ Project  
DYNCORP/NASA  
Building 270  
Ellington Field  
Houston, TX 77034***

***Phone: 281-244-9112***

***Email: [Wanda.J.Frederick@nasa.gov](mailto:Wanda.J.Frederick@nasa.gov)***

*This information is now on the website, too.*

The data archive went public on 17 June.

All preliminary data was removed from access.

Almost all data is on the archive. We will communicate with those few groups still preparing data.

Merges will need to wait until all data is available.

While video from the P-3B has been available for some time, we will continue to work on getting other ancillary information (e.g., HYSPLIT trajectories, satellite images, etc.)

Any questions on format or upload should be addressed to Gao Chen ([Gao.Chen@nasa.gov](mailto:Gao.Chen@nasa.gov)) or Ali Aknan ([Ali.A.Aknan@nasa.gov](mailto:Ali.A.Aknan@nasa.gov))

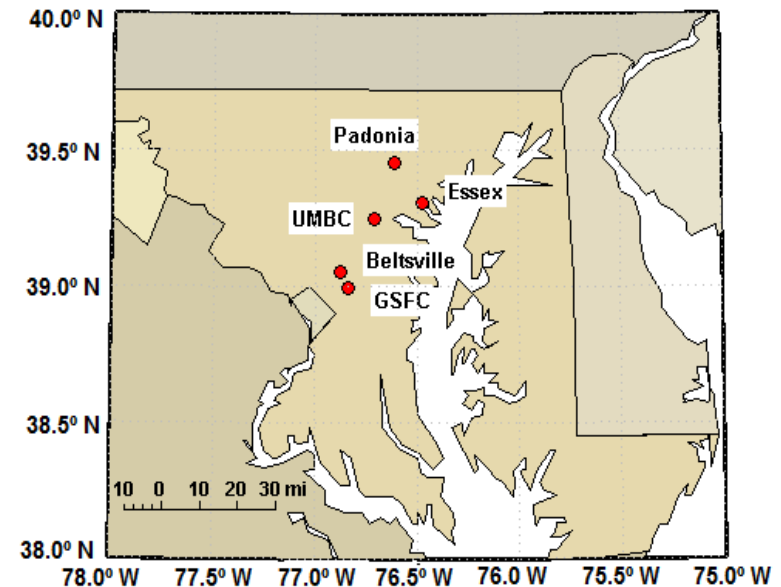
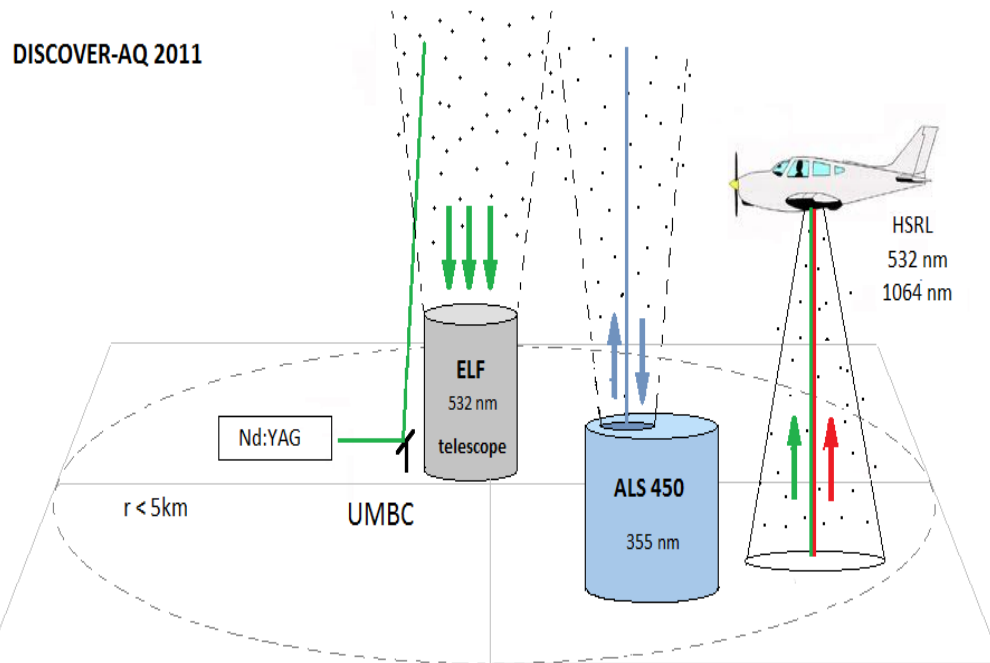
It is important to indicate the final data status in your last revision note. In addition, the entry of “STIPULATIONS\_ON\_USE” should indicate that the data is open to public.

# Retrievals of aerosol optical and microphysical parameters from hybrid lidar dataset during DISCOVER-AQ

P. Sawamura, D. Müller, R. M. Hoff, C. A. Hostetler,  
R. A. Ferrare, B. E. Anderson, B. N. Holben

# Methodology

From DAQ data, combine aircraft HSRL + elastic data (NASA/LaRC) at 532 nm and 1064 nm, respectively, with ground based elastic lidar at 355 nm (at UMBC) and perform the inversion methodology described by Müller et al (1998).



Lidar retrievals of volume and surface-area concentrations, effective radius, complex index of refraction and single scattering albedo were compared to in-situ measurements and AERONET retrievals when available.

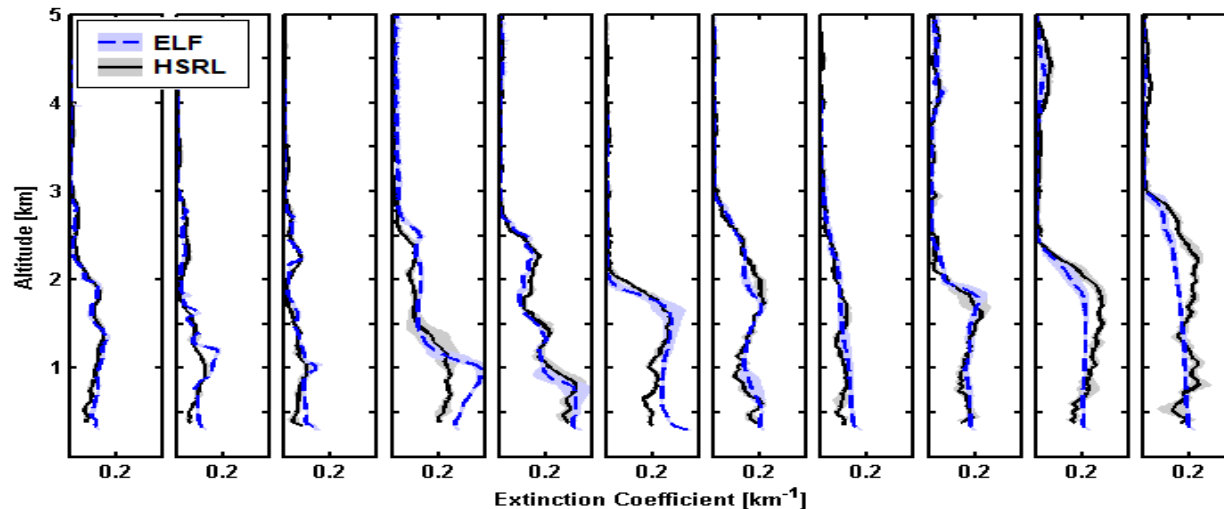


# Motivation

- As radiative forcing depends on the vertical distribution of aerosols, both optical and microphysical characteristics of aerosols must be assessed in various layers of the atmosphere.
- So far, size distribution, effective radius, single scattering albedo, and complex refractive index are commonly retrieved for the entire column.
- The method originally described by Müller et al (1998) has been applied mostly to Raman lidar datasets (nighttime). Retrievals have been concentrated in Europe and Asia. Only a few studies in the US and all of them with the same Raman system.

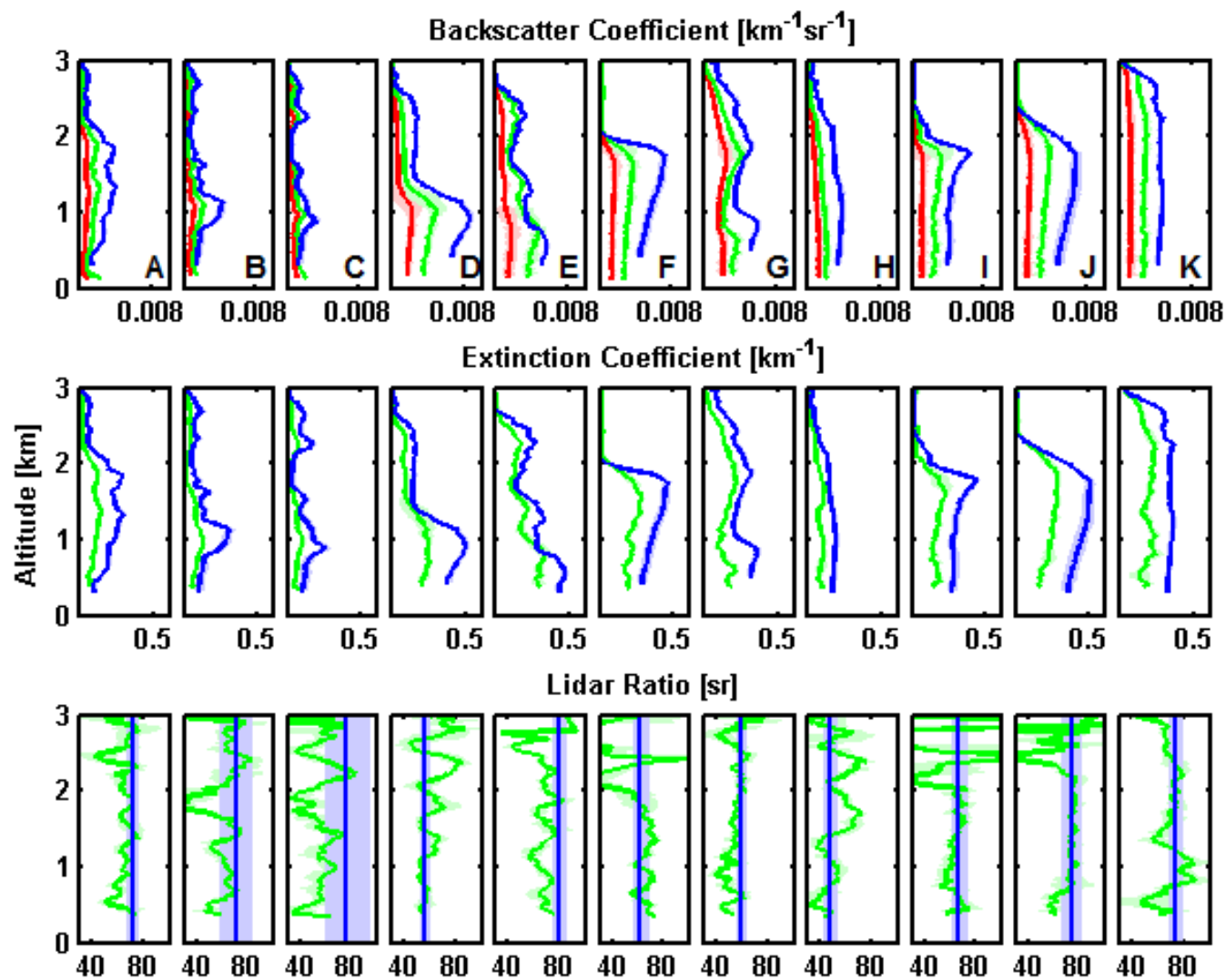
# Caveats

- ❑ Very time consuming, manual processing: layer by layer, overpass by overpass, day by day.
- ✓ Data is not completely colocated ( $\Delta r \leq 5\text{km}$ )
- ✓ In addition to HSRL, elastic retrievals (constant lidar ratio) are used.

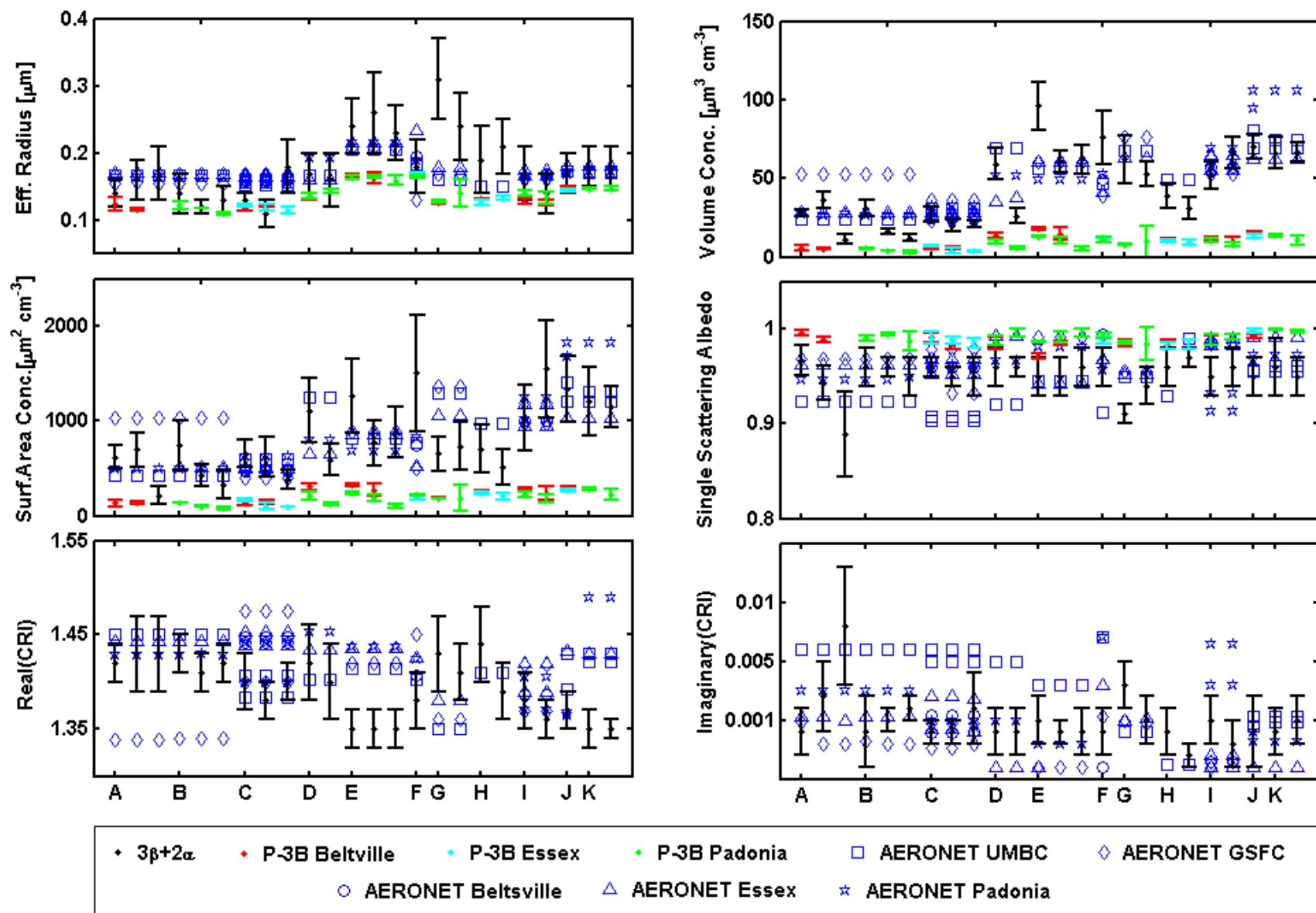


- ❑ Lack of truly colocated data for validation of results.

# Hybrid $3\beta+2\alpha$ dataset



# Results





**Table 2.** Average of results obtained from lidar retrievals (i.e.  $3\beta + 2\alpha$ ), in-situ measurements from P-3B flights, and AERONET retrievals of effective radius ( $R_{eff}$ , volume and surface-area concentrations, and single scattering albedo. Real and imaginary parts of the complex index of refraction were compared to AERONET only. Maximum aerosol layer height (AHL) was assumed as 1.5 km in order to convert AERONET volume and surface-area concentrations from per unit area to per unit volume. Mean values from AERONET are presented for three different averaging subsets. Number of data points for each subset is presented between parenthesis for size and optical related parameters.

	$R_{eff}$ [ $\mu\text{m}$ ]	Vol. Conc. [ $\mu\text{m}^3 \text{cm}^{-3}$ ]	S-Area Conc. [ $\mu\text{m}^2 \text{cm}^{-3}$ ]	SSA	Re(n)	Im(n)
$3\beta + 2\alpha$	$0.18 \pm 0.05$	$45 \pm 23$	$821 \pm 369$	$0.95 \pm 0.02$	$1.39 \pm 0.03$	$0.005 \pm 0.002$
P-3B Beltsville	$0.13 \pm 0.02$	$10 \pm 5$	$224 \pm 74$	$0.99 \pm 0.01$	N/A	N/A
P-3B Essex	$0.13 \pm 0.02$	$8 \pm 4$	$181 \pm 65$	$0.99 \pm 0.01$	N/A	N/A
P-3B Padonia	$0.14 \pm 0.02$	$8 \pm 3$	$178 \pm 57$	$0.99 \pm 0.01$	N/A	N/A
AERO UMBC <sup>1</sup>	$0.17 \pm 0.02$ (11)	$54 \pm 20$	$963 \pm 350$	$0.94 \pm 0.03$ (11)	$1.41 \pm 0.03$	$0.007 \pm 0.004$
AERO UMBC <sup>2</sup>	$0.17 \pm 0.01$ (8)	$51 \pm 21$	$925 \pm 377$	$0.94 \pm 0.02$ (5)	$1.40 \pm 0.03$	$0.007 \pm 0.003$
AERO UMBC <sup>3</sup>	$0.16 \pm 0.02$ (51)	$31 \pm 19$	$580 \pm 311$	$0.94 \pm 0.02$ (15)	$1.41 \pm 0.03$	$0.008 \pm 0.003$
AERO GSFC <sup>1</sup>	$0.18 \pm 0.03$ (10)	$51 \pm 15$	$871 \pm 297$	$0.98 \pm 0.01$ (10)	$1.40 \pm 0.04$	$0.003 \pm 0.002$
AERO GSFC <sup>2</sup>	$0.19 \pm 0.03$ (4)	$47 \pm 19$	$747 \pm 364$	$0.98 \pm 0.01$ (3)	$1.41 \pm 0.04$	$0.003 \pm 0.002$
AERO GSFC <sup>3</sup>	$0.16 \pm 0.03$ (53)	$33 \pm 21$	$603 \pm 333$	$0.98 \pm 0.01$ (20)	$1.40 \pm 0.03$	$0.003 \pm 0.002$
AERO Essex <sup>1</sup>	$0.18 \pm 0.02$ (10)	$47 \pm 16$	$783 \pm 259$	$0.97 \pm 0.02$ (10)	$1.43 \pm 0.02$	$0.004 \pm 0.003$
AERO Essex <sup>2</sup>	$0.18 \pm 0.02$ (4)	$45 \pm 21$	$761 \pm 323$	$0.96 \pm 0.03$ (2)	$1.41 \pm 0.03$	$0.005 \pm 0.005$
AERO Essex <sup>3</sup>	$0.16 \pm 0.03$ (45)	$27 \pm 21$	$471 \pm 345$	$0.97 \pm 0.02$ (13)	$1.42 \pm 0.04$	$0.004 \pm 0.002$
AERO Beltsville <sup>1</sup>	$0.17 \pm 0.02$ (4)	$40 \pm 13$	$673 \pm 250$	$0.98 \pm 0.02$ (4)	$1.42 \pm 0.03$	$0.003 \pm 0.002$
AERO Beltsville <sup>2</sup>	$0.17 \pm 0.01$ (2)	$40 \pm 20$	$732 \pm 375$	N/A	N/A	N/A
AERO Beltsville <sup>3</sup>	$0.16 \pm 0.02$ (70)	$27 \pm 21$	$487 \pm 315$	$0.97 \pm 0.02$ (10)	$1.40 \pm 0.03$	$0.003 \pm 0.002$ Tstrut
AERO Padonia <sup>1</sup>	$0.18 \pm 0.02$ (10)	$57 \pm 27$	$968 \pm 479$	$0.95 \pm 0.02$ (10)	$1.41 \pm 0.03$	$0.006 \pm 0.003$

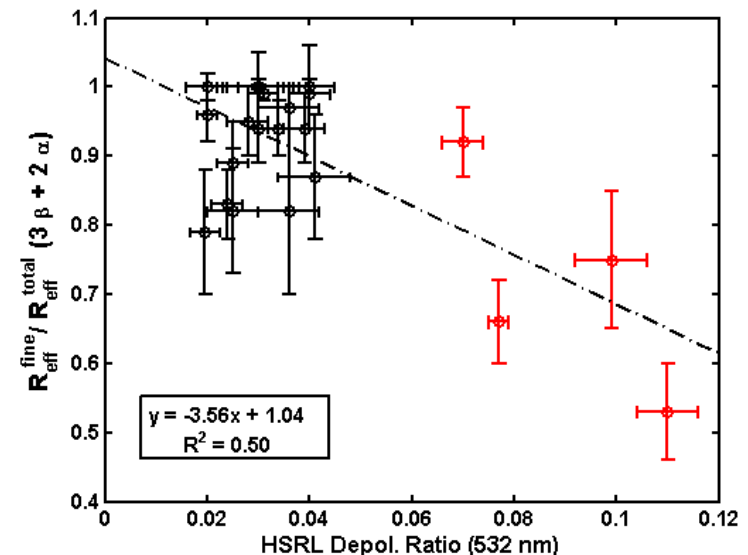
<sup>1</sup> Level 1.5: Data subset used to compare with lidar retrievals listed in Table 1.

<sup>2</sup> Level 2.0: Data subset used to compare with lidar retrievals listed in Table 1 (less data points).

<sup>3</sup> Level 2.0: Average of July 2011 data.

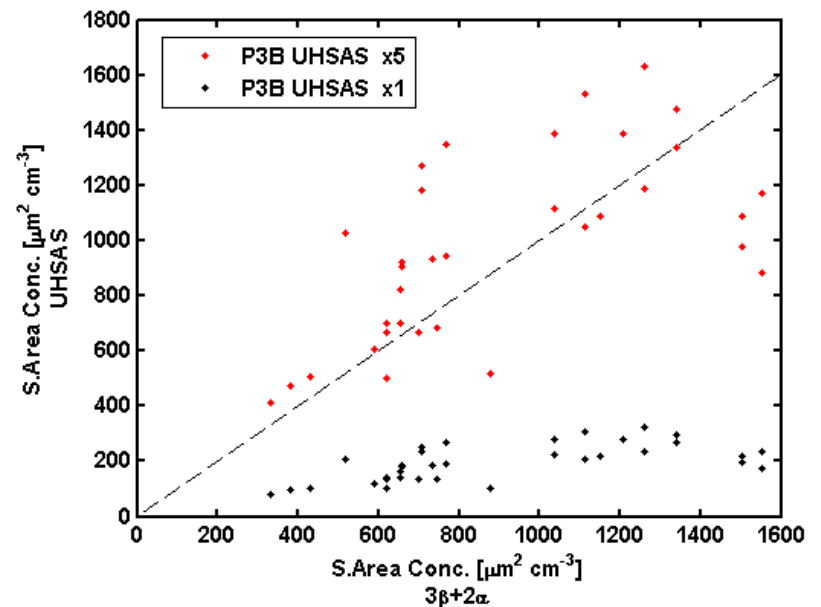
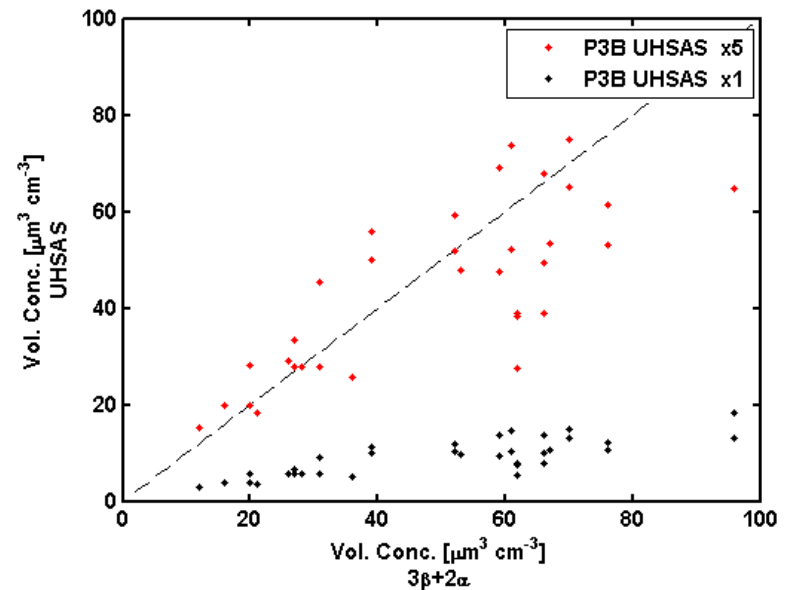
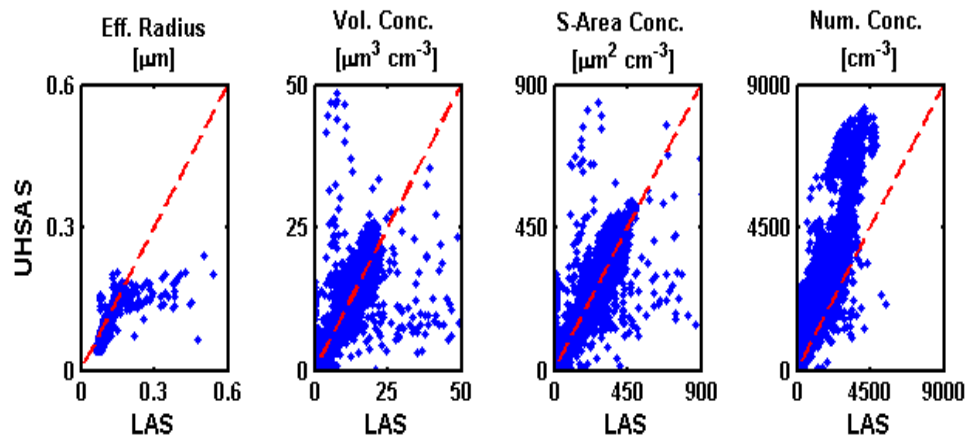
# Summary

- Better agreement with AERONET retrievals, overall. Effective radius bias varied within  $\pm 6\%$  among all stations, volume and surface-area concentrations  $[-18\%, +27\%]$ , single scattering albedo  $[-1\%, +3\%]$ ,  $\text{Re}[n]$   $[+0.7\%, +3\%]$  and  $\text{Im}[n] \pm 40\%$ . Slight improvement when comparing lidar retrievals to level 2.0 retrievals for volume, surface-area concentrations and real part of CRI. Bias towards higher  $\text{Im}[n]$  at UMBC station. 1.5 km aerosol layer height assumption for volume and surface-area concentrations seems reasonable.
- Variation of effective radius agrees with the variation observed in AERONET retrievals and in-situ measurements.
- Depolarization ratio (from HSRL-1) was shown to be a good indicator of retrieval quality (July 22<sup>nd</sup>).



# Summary

- Systematic bias observed in P-3B measurements. Size-related parameters were underestimated and single scattering albedo overestimated with respect to both lidar and AERONET retrievals. Volume and surface-area concentrations overestimated by 5x factor (~80% bias). Effective radius ~26%. Possible external inlet issue (?)



**Table 1.** List of cases analyzed. The letters in the first column represent the same cases as the ones depicted in Figure 2 and 3. Time column lists the time span of the combined HSRL-1 and ALS-450 measurements. Layers were chosen in regions where the intensive properties such as color ratio and depolarization ratio did not vary much. P-3B in situ column lists the location of spirals which were used to compare lidar retrievals with in-situ measurements and  $P\Delta t$  lists the respective time gap between the overpass at UMBC and the spirals. AERONET column lists the AERONET stations that were utilized for the retrievals comparison including levels 1.5 and 2.0, and  $A\Delta t$  lists the respective time gap between the measurements at UMBC and the AERONET measurements.

	Day / Time (UTC)	Layers	P-3B in-situ	$P\Delta t(\text{min})$	AERONET	$A\Delta t(\text{min})$
(A)	07/05 09:41-09:59	L1: 1.20 - 1.50 km (200 m) L2: 1.65 - 2.00 km (350 m) L3: 2.46 - 2.78 km (320 m)	Beltsville	+20	UMBC, GSFC, Essex, Padonia	+90, +90 +90, +90
(B)	07/05 10:52-11:02	L1: 0.75 - 1.17 km (420 m) L2: 1.56 - 1.70 km (140 m) L3: 2.61 - 2.76 km (150 m)	Padonia	-30	UMBC, GSFC, Essex, Padonia	+20, +20 +20, +20
(C)	07/05 11:58-12:10	L1: 0.84 - 1.08 km (240 m) L2: 1.41 - 1.60 km (190 m) L3: 2.19 - 2.34 km (150 m)	Beltsville Essex	+15 -15	UMBC, GSFC, Essex, Padonia, Beltsville	$\pm 40, \pm 40$ $\pm 40, \pm 40$ $\pm 40$
(D)	07/20 19:54-20:17	L1: 0.50 - 1.50 km (1 km) L2: 1.50 - 2.50 km (1 km)	Beltsville Padonia	-45 -30	UMBC, Essex Padonia	+90, +60, +5
(E)	07/21 14:47-14:54	L1: 0.50 - 0.75 km (250 m) L2: 1.00 - 1.50 km (500 m) L3: 2.00 - 2.50 km (500 m)	Beltsville Padonia	+40 +60	UMBC, GSFC Essex, Padonia	-40, -90, -90, -30
(F)	07/21 20:48-20:55	L1: 1.26 - 1.65 km (390 m)	Essex, Padonia	+30, -40	UMBC, GSFC, Essex, Padonia, Beltsville	+140, +140, +140, -40, +120
(G)	07/22 14:53-15:08	L1: 1.00 - 1.50 km (500 m) L2: 2.00 - 2.60 km (600 m)	Beltsville Padonia	-60 -30	UMBC, GSFC, Essex	-120, +15 -60
(H)	07/22 18:22-18:28	L1: 0.50 - 1.00 km (500 m) L2: 1.50 - 2.00 km (500 m)	Beltsville Essex	+5 -15	UMBC	+90
(I)	07/29 15:18-15:29	L1: 0.50 - 1.30 km (800 m) L2: 1.50 - 1.86 km (360 m)	Beltsville Padonia	+5 +30	GSFC, Padonia, Essex, Beltsville	(-5, -120), (-60, -120), (-60, -120), -120
(J)	07/29 20:12-20:18	L1: 0.50 - 2.00 km (1.5 km)	Beltsville, Essex	+5, -20	UMBC, Essex, Padonia	(+2, +60), +2, (+15, +60)
(K)	07/29 21:21-21:39	L1: 0.72 - 1.30 km (580 m) L2: 1.50 - 2.50 km (1 km)	Padonia	-60	UMBC, Essex, Padonia	(+5, -30), +60, -30